

## Past Distribution of *Plateumaris weisei* (DUVIVIER) (Coleoptera, Chrysomelidae, Donaciinae) at the Last Glacial Maximum in Shiga Prefecture, West Honshu, Japan

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**Abstract** Fossils of *Plateumaris weisei* (DUVIVIER) were found from a peat bed of the Last Glacial Maximum in Seri-kawa, Hikone, Shiga Prefecture, Japan. This is its first record from Honshu, the main island of Japan. The fossil record indicates that *P. weisei* became extinct in Honshu after the Last Glacial Maximum.

### Introduction

Abundant fossil records of beetles show the past distributional shifts during the geological

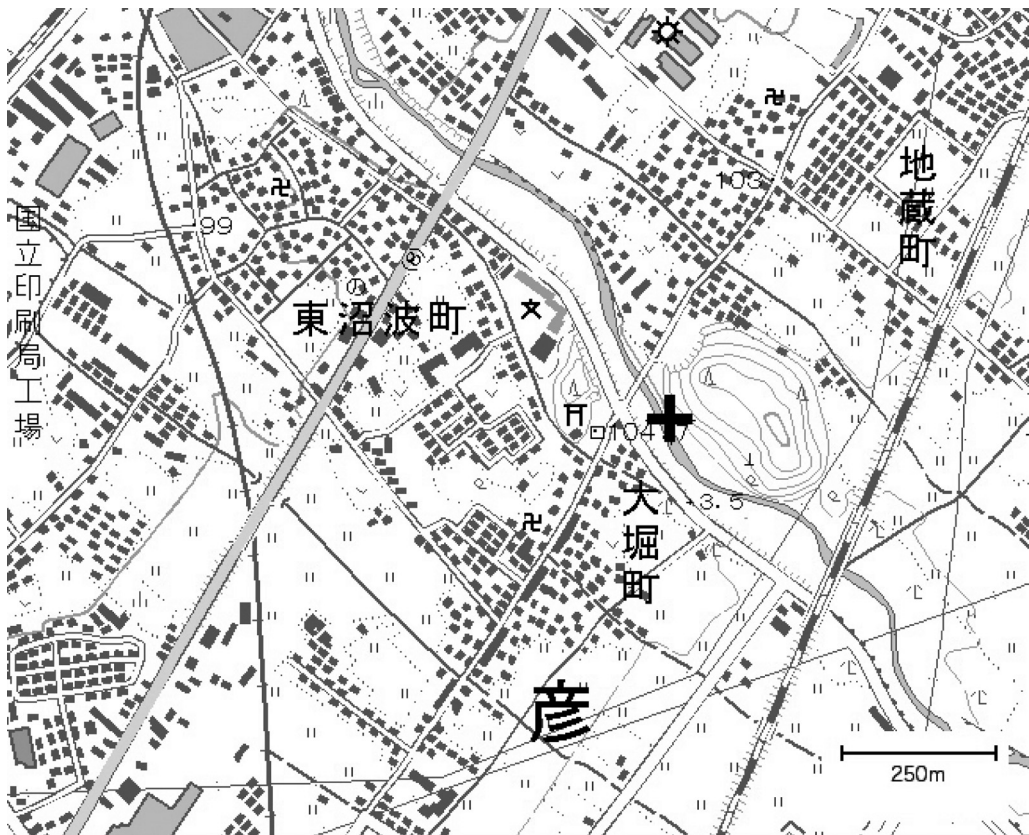


Fig. 1. Locality of the study site. Topographical map of “Takamiya” by Geographical Survey of Japan.

age (e.g. ABELLÁN *et al.*, 2010). In the Japanese archipelago, the shift may be caused by climatic changes and land-bridge formations but the paleo-biogeographic studies for beetles are scarce. A few cases of beetle extirpation in Japan during late Quaternary are reported: the two dytiscid beetles, *Ilybius nakanei* NILSSON and *Ilybius anjae* NILSSON are found from last glacial deposits in Honshu. It has been recognized that these two species became extinct by climatic warming in Honshu after the Last Glacial Maximum (MORI, 1995; MORI & ITOH, 1992; HAYASHI, 1996, 2005 a) since these species presently do not occur in Honshu (MORI & KITAYAMA, 2002).

Fossil donaciine beetles (Chrysomelidae, Donaciinae) are rich in the Quaternary peaty deposits in Japan. Their biogeography are discussed based on fossil records and phylogenetic analysis (SOTA & HAYASHI, 2007), however the fossil records from West Japan are scarce. We obtained some donaciine fossils from the Last Glacial Maximum deposit in Shiga Prefecture, West Japan (Fig. 1). Three fossils are indentified with *P. weisei* (DUVIVIER) of which recent distribution is the northern Palaearctic Region. In this paper, we describe its fossils and discuss its biogeographic significance.

### Systematic Palaeontology

#### Family Chrysomelidae

#### Genus *Plateumaris* THOMSON

#### *Plateumaris weisei* (DUVIVIER)

(Figs. 2, 3)

*Materials.* We obtained three well-preserved fossils. The male genitalia are preserved in the

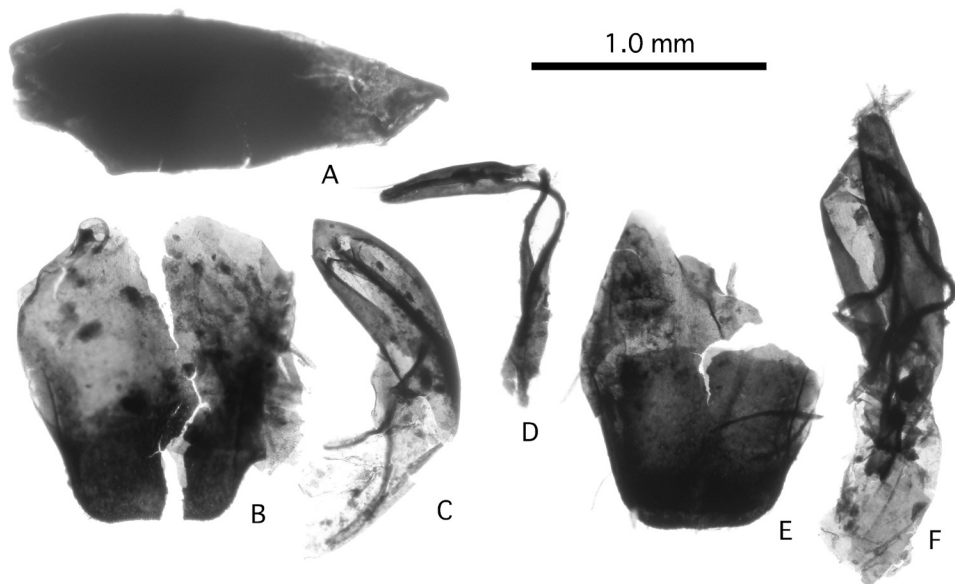


Fig. 2. Fossils of *Plateumaris weisei* (male). — A, metafemur; B, E, pygidium; C, median lobe; D, tegmen; F, median lobe and tegmen. Photographs by light microscope.



Fig. 3. Fossil endophallus of *Plateumaris weisei*. Scale bar is 0.5 mm. Photographs by light microscope.

abdomen of three fossils [in collection of the Osaka Museum of Natural History].

*Description and identification.* The diagnostic features of the species are as follows: metafe-mur with a blunt tooth under side (Figs. 2A); male pygidial apex truncate or shallowly emarginate (Figs. 2B, E); median lobe of male genitalia gradually narrowed apically without subapical corner, apex more or less acute (Fig. 2C); a cap of tegmen swollen basally and gradually narrowed apically, apex more or less rounded (but one specimen notched); endophallus (Fig. 3d) preserved in medianlobe, basal supporting block (BSB) divided into two parts; apical part of endrophallic lateral digit (ELD) absent; median ejaculatory guide (MEG) remarkably short and triangular, paired dorsal sclerites (PDS) indistinct. Remarkable shape of MEG are not found from any other members of the genus *Plateumaris* except for *P. weisei*.

*Locality and horizon.* The fossil beetles were found from the peaty silt layer at riverbed of River Seri (Seri-kawa) at Obori, Hikone, Shiga Prefecture (see SHIYAKE, 2009). The radiocarbon

age of the fossil horizon is already reported as  $16230 \pm 400$  y. B. P. (OOI & TSUJI, 1989).

*Associated beetles.* The fossils *P. weisei* are associated with *Carabus granulatus* LINNAEUS (SHIYAKE, 2009), *Lachnocrepis prolixa* (BATES), *Coelostoma orbiculare* (FABRICIUS), and *Donacia splendens* JACOBSON.

### Discussion

Recent *Plateumaris weisei* is a cold-adapted species, which is presently distributed in Hokkaido, NE China, Mongolia, Siberia and North Europe (ASKEVOLD, 1991). Figure 4 shows its recent distribution in and around Japan (HAYASHI, 2004, 2005 b) and its fossil locality.

The fossil record of *P. weisei* from Shiga Prefecture proves that the species was distributed in West Japan during the Last Glacial Maximum and became extinct in Honshu after the age. However, *P. weisei* was probably not widely distributed in Honshu because its fossils have not

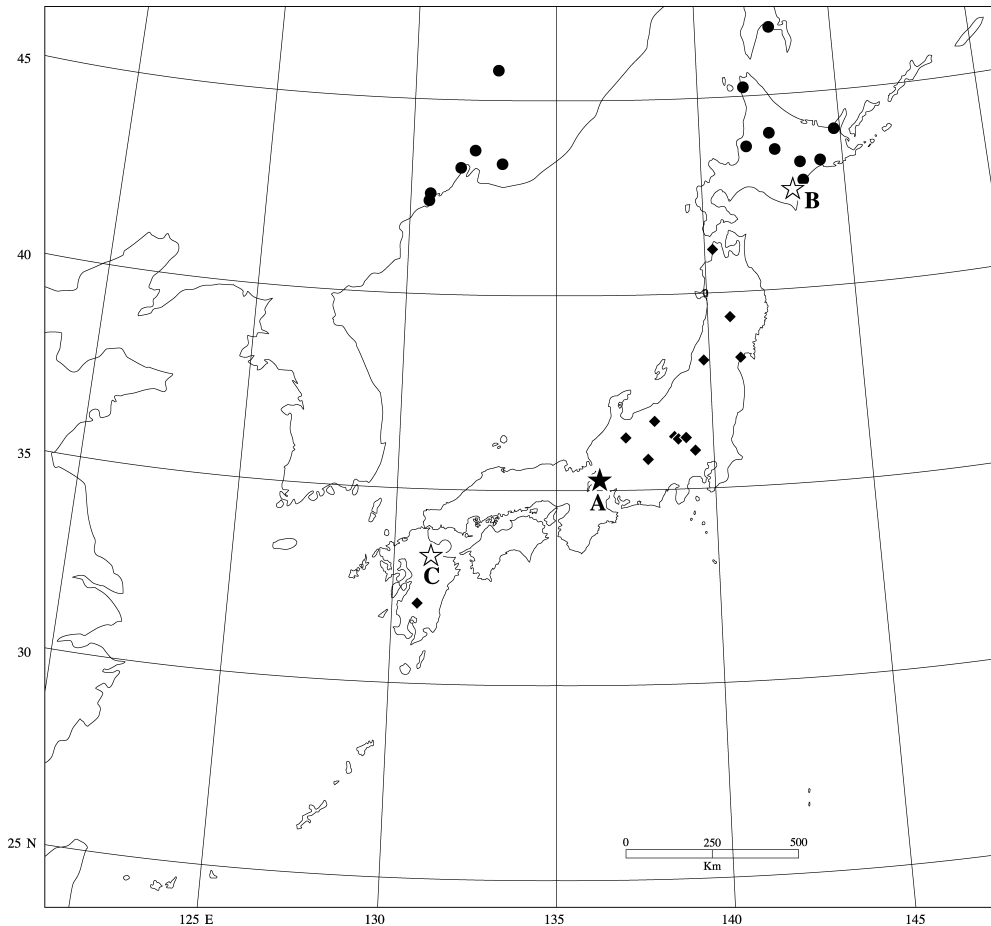


Fig. 4. Recent distribution (circle) and fossil localities (star) of *Plateumaris weisei*, and Late Pleistocene beetle localities in Japan (diamond). — A, Hikone, Shiga Pref. (Late Pleistocene: This study); B, Taiki, Hokkaido (Late Pleistocene: HAYASHI & SHIYAKE, 2009); C, Kokono, Ōita Pref. (Middle Pleistocene: HAYASHI *et al.*, 2009).

been recorded from 16 sites in north to central Honshu (HAYASHI, 2007; and our unpublished data). Furthermore, seven donaciine beetle species are reported from Late Pleistocene deposits in Nojiri-ko Site Group in Nagano Prefecture, central Honshu, but even the fauna which is rich in species number do not include *P. weisei* (HAYASHI, 2007). We would assume one possibility that *P. weisei* had immigrated to West Japan from the continental region via Korean Peninsula. Two other fossil localities of *P. weisei* are known from Japan: the Middle Pleistocene Nogami Formation in Kuroiga, Kokonoe, Ōita Prefecture, central Kyushu (HAYASHI *et al.*, 2009); the early Late Pleistocene Biraotori Formation in Aikawa, Taiki-chō, Hokkaido (HAYASHI & SHIYAKE, 2009). The record from Ōita Prefecture also suggests that cold-adapted beetles immigrated to West Japan from the continent during the cold period in the Quaternary.

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### 要 約

林 成多・初宿成彦：滋賀県彦根市から産出した最終氷期のヒラシマミズクサハムシ。—— 現在、国内では北海道以北に分布するヒラシマミズクサハムシ（ヒラシマネクイハムシ）*Plateumaris weisei* (DUVIVIER)の化石が滋賀県彦根市芦川河床の最終氷期の泥炭層から産出した。この化石記録は最終氷期の西日本における本種の確実な分布を示している。ヒラシマミズクサハムシの化石はこれまで本州の東部では全く産出しておらず、分布していなかった可能性が高い。従って、本州への移入の経路は大陸から朝鮮半島経由であったことが推定される。

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